Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –IIst SEMESTER–EXAMINATION – JULY- 2012

Subject code: 1724003 Date: 10/07/2012

Subject Name: Optimization in Rubber Industries

Time: 10:30 am – 13:00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Write necessary any sufficient conditions for an extreme value of multivariable objective function and find out stationary point for **07**

$$y = 1 + 8x + 2x^2 - \frac{10}{3}x^3 - \frac{1}{4}x^4 + \frac{4}{5}x^5 - \frac{1}{6}x^6$$

(b) Find the specification of an open-topped rectangular tank whose total area is to be 108 m^2, if a maximum volume is required. **07**

Q.2 **(a)** Discuss optimum scheduling and sizing of batch production plants. **09**

(b) Differentiate flow shop and job shop plants. **05**

OR

(b) Discuss model for optimization of batch production plant. **05**

Q.3 **(a)** An open top box is to be made out of a piece of cardboard measuring 2m X 3m by cutting off equal surfaces from the corners and turning up the side. Find dimensions of the box for maximum volume. **07**

(b) Using the method of Lagrangian multipliers find the minimum of **07**

$y = 4x_1^{\,2} + 5x_2^{\,2}$ subject to $2x_1 + 3x_2 = 6$.

OR

Q.3 **(a)** Find the value of x in the interval (0,1) which minimizes the function $f = x(x - 1.5)$ with ± 0.05 using Golden Section search or Fibonacci search technique. **07**

(b) A length of wire is to cut in two parts. One portion is to be bent into the form of a circle, and the other into the form of a square. In what ratio must the wire be cut if the sum of the areas enclosed by the circle and square is to the least possible? **07**

Q.4 **(a)** Explain the Complex method of Box with example and compare it with Sequential Simplex technique. **07**

(b) Explain how the Rosenbrock method gives acceleration in both direction and distance. **07**

OR

Q.4 Define a suitable search region and a feasible initial base point for the complex method of search in minimizing $y = 4x_1 + x_2 + 2x_3$ subject to the restrictions that $x_i \geq 0$ and **14**

$$x_1 + x_2 + x_3 \leq 6$$
$$5x_1 - x_2 + x_3 \leq 4$$
$$x_1 + 3x_2 + 2x_3 \geq 1$$

Setup a Box complex method of search and carryout five cycles of search.

Q.5 **(a)** Explain the interpretations with examples for **07**

- Zero coefficient in column.
- No positive ratio.
- Identical values of smallest positive ratio.

while solving any linear programming problem using simplex method.

(b) Explain the basics of population based search techniques and discuss working of Genetic Algorithm for optimization. **07**

OR

Q.5 A manufacturer requires a mix consisting of 40 % A, the remainder being made up of B and C in equal proportions. This mix can be made up by mixing a number of available raw materials, the properties and cost of which are tabulated below. Find the cost of the chipset blend and the amount of each type of raw material which should be purchased per unit weight of mix product produced. **14**

		Available raw materials				
		1	2	3	4	5
Analysis	% C	10	10	40	60	30
	% B	10	30	50	30	30
	% A	80	60	10	10	40
Cost	Rs / kg	41	43	58	60	76

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